

A CASE OF ACUTE OSTEOMYELITIS OF THE FEMUR,
WITH GENERAL SYSTEMIC STAPHYLOCOCCUS
AUREUS INFECTION, TERMINATING
IN RECOVERY.¹

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GUSSIE P., a child of eight years of age, was admitted to the Mount Sinai Hospital on July 27, with the following history: Five days previous to his admission he had fallen and struck himself in the neighborhood of the left gluteal fold; he was able to walk home immediately after the injury. The next day he experienced considerable pain in the region of the hip-joint, with chills and fever. The pain and fever continued, some swelling appeared in the region of the hip-joint, and the boy was unable to move the joint. On admission, late at night, his temperature was 105.6° F.; pulse, 120; respirations, 26; and the physical examination gave the following data:

Lungs.—Harsh friction râles over both chests heard with inspiration and expiration.

Heart.—Sounds distinct, no change in the cardiac area.

Liver.—Slightly enlarged, extending one finger's breadth below the free border of the ribs.

Spleen.—Normal to percussion and palpation.

Abdomen.—Everywhere soft, except in the left groin, where the psoas muscle was very tense and painful.

Left Lower Extremity.—Lay in the inverted position. Very slight swelling of the upper part of the thigh; no shortening; trochanter major occupied the normal position; genital folds normal; no pain on pressure over the hip-joint, quite severe pain in the upper part of the thigh. Over the inner part of the thigh, from Poupart's ligament downwards, the muscles were tense. On rotation of the thigh

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at the hip-joint there was a marked reflex muscular spasm, extremities otherwise normal. Urine normal.

When I saw the boy the next morning his temperature had fallen to 103.4° F., but the local signs remained about the same. Vague and scanty as these local manifestations were, I considered the child was suffering from an acute osteomyelitis of the femur, in the neighborhood of the upper epiphysis, and for the following reasons: The hip-joint itself was not distended by any fluid. Impact of the head of the femur against the acetabular cavity did not cause pain. This lack of distention and absence of joint tenderness excluded disease of the joint itself, whereas the local pain, the tenseness of the psoas muscle, and the reflex muscular spasm elicited by rotation of the thigh, indicated, in the absence of any disease of the ilium, an inflammatory affection of the femur due to the traumatism he had sustained.

I therefore immediately proceeded to cut down upon the femur at its upper end, making my incision through the soft parts at the outer side of the limb. The periosteum was found to be attached to the bone, and the cortex of the latter bled when the periosteum was separated from it. No pus was found either at the epiphysis or subperiosteally. As the temperature had been declining since the child's admission to the hospital, I deferred opening the marrow canal for twelve hours, until I could determine whether the inflammation was regressing.

After the operation the patient was still very restless and delirious; he complained of considerable pain, and his urination was involuntary. The temperature and pulse rate continued high, 102° F. to 103.4° F., and 122 to 124 respectively. The next morning I therefore opened the marrow cavity, and found therein a few drops of pus and fluid fat. A culture was taken from the medullary cavity, and also one from the blood of the forearm. The medullary cavity was thoroughly curetted and drained, and the entire wound dressed wet and left open. The poisoning of the patient seemed so intense, that, without waiting for a bacteriological report, I ordered the boy to be given the antistreptococcic serum. That night he was given two injections of the serum, —one of ten cubic centimetres at nine o'clock, and one of five cubic centimetres at midnight.

On July 30, the night of the second operation, the child slept at intervals; he did not complain of any pain, and was very quiet. Temperature, 101.8° F., to 103.6° F.; pulse, 120 to 162; respirations 26 to 42. Free catharsis and diuresis was established, and the antistrep-

tococcic serum was continued, two injections being given daily of ten cubic centimetres each. The bacteriological report of the cultures was as follows :

Culture taken from the bone marrow was sterile, and it remained so during a period of observation of seven days.

Culture taken from the blood, two cubic centimetres, showed the presence of a pure culture of staphylococcus aureus. This finding was confirmed by a second culture of the blood made on August 2, three days later.

During the next few days the constitutional symptoms continued with nearly the same intensity, *i.e.*, the temperature remained about 101° F. to 103° F., the pulse rate between 140 and 160. On August 2 the antistreptococcus serum was stopped, and the unguentum Credé substituted therefor. The wound was moist, and pale, flabby granulations commenced to appear.

August 8.—During the past week there was little change in the constitutional or local manifestations. The temperature remained high, varying between 101° F. and 105° F., the pulse rate continued very rapid, 120 to 140 per minute. A Widal examination of the blood gave a negative result. The urine showed no diazo reaction. Physical examination gave the following result :

The Left Chest.—In the axillary line, from the fourth space downward, and in the scapular line, from the angle downward, there was flatness to percussion, no vesicular murmur, no fremitus. This flatness was continuous with splenic flatness, and merged in front with cardiac dulness. The spleen was just palpable beneath the free border of the ribs. The right chest showed no abnormality. There was slight pericardial frictions, especially to be heard at the base. The apex beat was not displaced. These physical signs in the absence of any pulmonary lesion led me to suspect a metastatic focus of suppuration in the left subphrenic space, and accordingly, on August 11, I aspirated under chloroform. I first aspirated in the ninth intercostal space in the scapular line, passing my needle through the diaphragm into the subphrenic space, but the aspiration proved negative. I next aspirated the pleural cavity in the eighth space, but with a like result. I also aspirated in the anterior axillary line, in the sixth space, with the intention of entering the anterior aspect of the left subphrenic region, but obtained no pus. I sent the boy back to bed without further procedure, to watch subsequent developments.

On August 15 the constitutional symptoms continued with equal intensity. The kidneys were commencing to secrete very little urine,

twelve to fourteen ounces daily, although the child took a large amount of fluid and solid nourishment; the urine was of a specific gravity of 1004, contained no albumen; the urea was normal. The physical signs in the left chest continuing about the same, and the temperature being suggestive of a metastatic focus of suppuration, I determined to again explore with the needle. Aspiration in the same regions as before yielded again practically negative results,—a little bloody serum being obtained from the left pleural cavity. The pericardial sac was also aspirated, and a little serum withdrawn.

On August 18 a specimen of urine was drawn from the bladder with a sterile catheter, and into a sterile tube, and sent to the laboratory for bacterial examination. The bacteriologist reported the presence of the staphylococcus aureus therein. Subsequent examinations of the urine, on August 21 and 23, showed no staphylococcus aureus, although observed for seven days.

On August 22 the pericardial friction sounds had disappeared, and the physical signs in the left chest had regressed considerably, the lung coming down to almost the limit of the pleura. The urine was of low specific gravity, 1002, contained one per cent. of urea, and was slightly more abundant. The wound was covered with pale, flabby granulations.

On August 28 the examination of the blood proved it to be sterile, after a period of observation of seven days. The constitutional symptoms had moderated considerably. The temperature did not rise above 101° F., the pulse still remaining about 120. The kidneys were secreting very little urine, and there was developing general anasarca, ascites, and hydrothorax. The liver was very much enlarged, extending downward, almost to the level of the umbilicus. There was also considerable tenderness over the liver.

On September 2 the liver remained very large and tender, and under chloroform I made an exploratory aspiration, with negative results. Aspiration of the pleural cavities yielded clear serum. As the kidneys were functioning very badly, and not responding to any of the methods of treatment at our command, and presuming that the same swelling which affected the liver and spleen was also present in the kidneys, and it having been urged also that there was a possibility of cortical abscesses in these organs, I cut down upon the right kidney with the dual purpose of splitting its capsule and thus relieving its tension, and also of exploration. The kidney was found to be swollen; exploration of its cortex gave a negative result as to suppuration. The cortex was pale, and I excised a wedge-shape piece for

pathological examination. It was reported as being the seat of *acute inflammation and degeneration*.

On September 3 and 4 there was no change in the patient's condition; his temperature was still about 100° F. to 101° F., pulse rate 130; the urine was still very slight in amount, eight to ten ounces per day, the anasarca becoming more marked. On September 5, three days after the splitting of the capsule of the kidney, he passed twenty-two ounces of urine, and thereafter, up to September 10, he passed from twelve to fourteen ounces daily, a gain of about six ounces over the previous amount. His urine never contained casts.

On September 10 the nephrotomy wound had healed. The patient's general condition was about the same, his temperature about 100° F.; pulse 120; marked ascites and hydrothorax, and general œdema. He took considerable nourishment at all times. On that day his mother insisted on removing the child to her own home against our advice.

Subsequent History.—The trip home from the hospital weakened the boy very much, and he was in a very precarious condition for a week following. He passed very little urine, but continued to take considerable nourishment. About six days after his return home, he commenced to pass large quantities of urine; and this excessive urination continued until his abdomen became entirely flat, and his legs and body generally had returned to their natural contour. He gained rapidly in health and strength, and the physical examination on December 3, 1899, gave the following data:

Child is still anæmic, but fairly well nourished, and of fair intellect.

Lungs.—Normal in every respect.

Heart.—Area not enlarged. Apex beat in normal situation. No friction sounds. Heart sounds clear and distinct.

Abdomen.—Flat.

Liver.—Not enlarged. Dulness extends from fourth rib to the free border.

Spleen.—Normal.

Kidneys.—Urine normal in amount (estimated) and in character.

He had regained his health entirely. There were no physical signs in the chest pointing to any abnormality; the liver and spleen were of normal size; the abdomen was perfectly flat; the urine was normal in every respect; the boy walked straight; and the femur had entirely healed. The heart sounds were clear and distinct; the apex beat in its normal position; and no friction râles could be heard.

Boy walked well. Femur has healed entirely. The bacteriological examinations of the blood and urine were carried out by the assistant pathologist of the hospital, Dr. Libman.

Comments.—This patient came into the hospital suffering with an acute infectious osteomyelitis due to the staphylococcus aureus, and induced by the traumatism he had sustained. That no germs were found in the culture taken from the medullary cavity was most probably due to the fact that that particular droplet of serum which was taken up in the loop of the needle happened to be sterile. I am convinced, that had several different droplets been taken, the staphylococci would have been found. The infection of the blood was undoubtedly from this primary focus in the bone, and the good effects of the operative procedure were seen at once in the subsidence of the pain and cerebral manifestations. Although the local symptoms had been relieved, the general septicæmic state still continued, due to the infection of the blood by the organism and its toxins. I wish, here, to call attention to the fact that, although only five days had elapsed since the original traumatism, and only four days since the first manifestations of the disease, yet general systemic infection had already occurred. Now, as regards the use of the serum in this case, I have already before this Society stated my opinions as to when the serum can be expected to be of any value,¹—viz., only in those cases where there is an infection of the blood with the organism itself,—and I have also stated that if any good is to result from the serum, it must be used very early. In this boy I suspected general infection, and, without waiting for a bacteriological report of the blood-culture, I at once put him upon the antistreptococcic serum. The next day the pathologist reported that the blood showed the presence of the *staphylococcus aureus*. I should at once have put the child upon the antistaphylococcus serum, but, having commenced with the former, I decided to continue its use. Whether or not it had any influence I am unprepared to say, but certain it is that *no metastatic focus of suppuration* developed in this boy dur-

¹ The Treatment of Pyogenic Osteomyelitis.—*Philadelphia Monthly Medical Journal*, July, 1899.

ing the period of almost seven weeks that he was under my observation, in spite of the fact that there were virulent pyogenic organisms circulating in his blood. It might be argued, "of what value can the antistreptococcus serum be in staphylococcus infections?" This can be answered by mentioning the work lately performed by Emmerich and Low. They proved by experiments on guinea-pigs that the pyocyanus enzymes were capable of neutralizing the effects of the diphtheria toxines; and have even gone so far as to urge the use of "pyocyanose" (the enzymes of the bacillus pyocyanus) in the treatment of diphtheria in the human subject, in place of the diphtheria antitoxin. Furthermore, as bearing upon the same subject, it is only necessary to recall the long, well-known fact, that the enzymes of pyocyanus work antagonistically to the anthrax organism and its toxines. This antagonistic relation of the enzymes of one organism to bacteria and toxines of different species has been recognized also in the manufacture of the antistreptococcus serum; where the animal whose serum is to be used has been injected with several varieties of both the streptococcus and staphylococcus, such serum being known as the "mixed serum."

My use of the unguentum Credé was not founded on any rational basis, but was given in a desperate case where every therapeutic procedure should be made use of. I do not consider that it had any influence upon the course of the disease.

Now, as to the effect of the organism, or its toxines, on the viscera of the patient. This is well seen in the pericarditis, the acute degeneration of the kidneys, and the acute degeneration of the liver and spleen, as manifested by their enormous size. The physical signs which led me to aspirate the left subphrenic region I can account for only by the enlargement of the spleen upward instead of downward. The numerous punctures that I made relieved the congestion of this organ, just as the splitting of the kidney capsule relieved the congestion of the latter, and thereby diminished its size, which accounts for the disappearance of the physical signs. What became of the organisms in the circulating blood is well shown by their presence in the urine in almost pure culture, and their excretion in the urine is

still further illustrated by their disappearance from it when the blood itself became sterile.

When the boy left the hospital his toxæmia and his blood infection had disappeared. He was then suffering from the effect of these two factors upon his organs, viz., the acute inflammation and degeneration of the viscera.

To Recapitulate.—The points worthy of notice in this are as follows:

(a) An infection of the medullary cavity of the femur by the *staphylococcus aureus*, induced by his traumatism.

(b) An early blood infection by the same organism and its toxines.

(c) The use of the *antistreptococcus serum*, and the absence of any metastatic focus of suppuration in a *staphylococcus infection*.

(d) The subsequent elimination of the organism by the kidneys.

(e) The effects of this organism and its toxines upon the viscera, as shown by the acute degeneration and inflammation of the latter.